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10/030121  
531 Rec'd PCT/PT 24 JAN 2002

DOCKET NO.: 218072 US

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

IN RE APPLICATION OF: Andrew SUTHERLAND, et al.

SERIAL NO.: NEW U.S. PCT APPLICATION

FILED: HERewith

INTERNATIONAL APPLICATION NO.: PCT/GB00/02877

INTERNATIONAL FILING DATE: July 26, 2000

FOR: PIPE REPAIR DEVICE AND METHOD

**REQUEST FOR PRIORITY UNDER 35 U.S.C. 119**  
**AND THE INTERNATIONAL CONVENTION**

Assistant Commissioner for Patents  
Washington, D.C. 20231

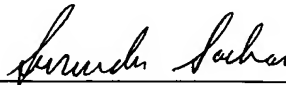
Sir:

In the matter of the above-identified application for patent, notice is hereby given that the applicant claims as priority:

<u>COUNTRY</u>	<u>APPLICATION NO</u>	<u>DAY/MONTH/YEAR</u>
Great Britain	9917674.5	29 July 1999

Certified copies of the corresponding Convention application(s) were submitted to the International Bureau in PCT Application No. PCT/GB00/02877. Receipt of the certified copy(s) by the International Bureau in a timely manner under PCT Rule 17.1(a) has been acknowledged as evidenced by the attached PCT/IB/304.

Respectfully submitted,  
OBLON, SPIVAK, McCLELLAND,  
MAIER & NEUSTADT, P.C.



Gregory J. Maier  
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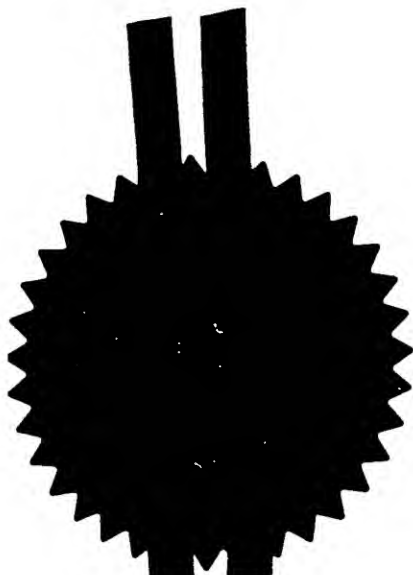
I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

I also certify that by virtue of an assignment registered under the Patents Act 1977, the application is now proceeding in the name as substituted.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

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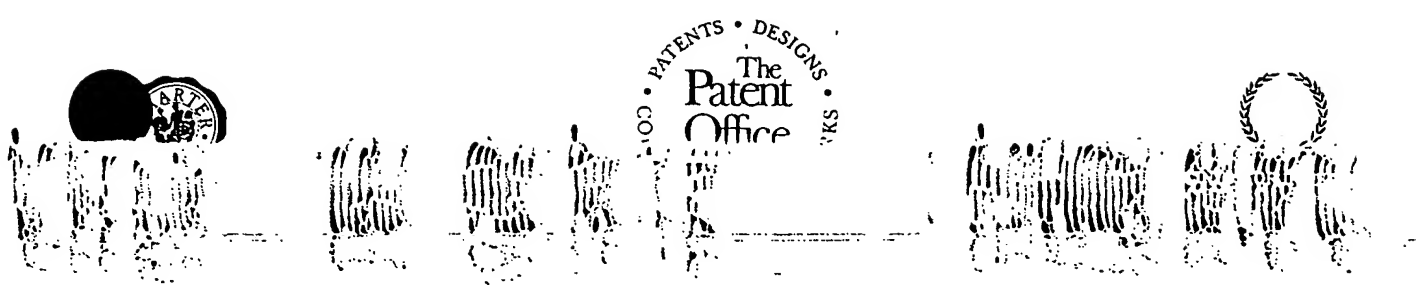


Signed

*Andrew Gersey*

Dated

- 2 AUG 2000




GB9917674.5

By virtue of a direction given under Section 30 of the Patents Act 1977, the application is proceeding in the name of

BG INTELLECTUAL PROPERTY LTD  
100 Thames Valley Park Drive  
READING  
RG6 1PT  
United Kingdom

● Incorporated in the United Kingdom

[ADP No. 07817760001]



GB9917674.5

By virtue of a direction given under Section 30 of the Patents Act 1977, the application is proceeding in the name of

BG TRANSCO PLC  
100 Thames Valley Park Drive  
READING  
Berkshire  
RG6 1PT  
United Kingdom

Incorporated in the United Kingdom

[ADP No. 07904220001]

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Cardiff Road  
Newport  
Gwent NP9 1RH

1. Your reference

5008

2. Patent a  
(The Pat

9917674.5

29 JUL 1999

3. Full name, address and postcode of the or of each applicant (underline all surnames)

BG plc  
100 Thames Valley Park Drive, Reading  
Berkshire, RG6 1PT, GB  
SECTION 30 (1977 ACT) APPLICATION FILED

4.5.00

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

SECTION 30 (1977 ACT) APPLICATION FILED  
England & Wales

71 66598001

4. Title of the invention

Pipe Repair Device and Method

5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

David J Morgan  
Intellectual Property Department  
BG plc, 100 Thames Valley Park Drive,  
Reading, Berkshire, RG6 1PT, GB

Patents ADP number (if you know it)

2568003

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country	Priority application number (if you know it)	Date of filing (day / month / year)
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7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing (day / month / year)
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8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

yes

- a) any applicant named in part 3 is not an inventor, or
  - b) there is an inventor who is not named as an applicant, or
  - c) any named applicant is a corporate body.
- See note (d))

Patents Form 1/77

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Description

7

Claim(s)

3

Abstract

1

Drawing(s)

2

42 + 2 (3+3)

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 9/77)

1

Request for substantive examination (Patents Form 10/77)

Any other documents (please specify)

11.

I/We request the grant of a patent on the basis of this application.

Signature

Date

David J. Morgan 26/7/99

12. Name and daytime telephone number of person to contact in the United Kingdom

David J Morgan 01189 29 2076

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PIPE REPAIR DEVICE AND METHOD

The invention relates to pipe repair and more particularly to repairing existing buried pipes.

In the past to gain access to a gas main, for example, a large hole has to be dug to allow the operative to get down into the hole and then to use various methods to gain access to an aperture in the pipe that needs repairing or sealing.

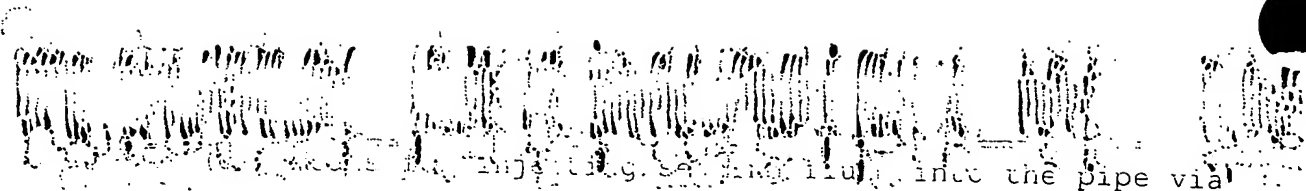
Such arrangements require a large hole to be dug with the necessary side wall support to allow the operative safe access to the pipe so as to carry out a repair.

The present invention is concerned with a device and method which allows the operative to work above ground without the need to excavate large holes.

According to the invention there is provided a pipe repair device including

- (a) an elongate insulated handle to allow operations to be carried out above ground,
- (b) means for forming an aperture in the pipe attachable to the handle,
- (c) means for fixing a fluid entry device to the pipe attachable to the handle, and



  
the entry device, said means for injecting sealing fluid being attachable to the handle.

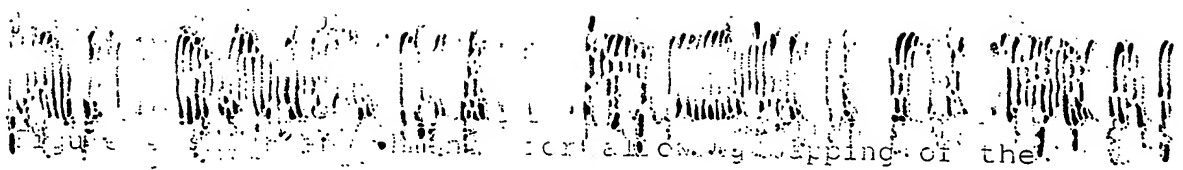
Further according to the invention there is provided a method of repairing a fluid pipe including the steps of forming an aperture in the pipe from above ground by means of a device attached to an elongate insulated handle; fixing a fluid entry device to the pipe by means attached to the handle; and injecting sealing fluid into the pipe via the entry device by means attached to the handle.

The invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 shows an elongate handle with associated air trigger and air motorised devices attachable thereto;

Figure 2 shows a fluid sealing device attachable to the handle;

Figure 3 shows a drill with a gauge to allow only partial drilling through the pipe;

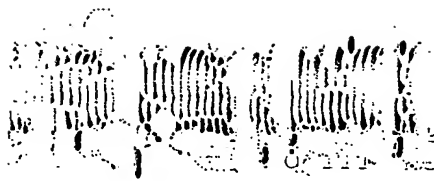


hole to provide a thread;

Figure 5 shows an attachment with a nipple for insertion into the tapped hole; and

Figure 6 shows completion of the drilling through the nipple into the pipe interior.

The arrangement of Figure 1 includes an elongate rod-like handle 10 (e.g. two metres in length) of insulated material (e.g. fibreglass) to prevent electric shock which could otherwise occur if the ground contained buried cables adjacent the pipe to be partially excavated. The handle is hollow and is sealed at one end by cap 11 and terminates at the other end by adapter 12 which include an air connection attachment 13. Towards the other end of the handle 10, an air inlet 14 with associated nipple 15 is provided. To this inlet 14, an air supply trigger 16 operable by handle 17 is attachable. The hollow handle 10 and the air trigger 16 are operable at pressures typically of 110 psi. A source of compressed air (not shown) is connected to trigger 16 at coupling 18 to act as a power source for items attached to adapter 12 and air connection 13. Devices such as the air-knife 20 with blade 21 and the



Drill head 25 with drill bit 26 can be attached and powered (e.g. at 1800 rpm) under the control of trigger 16.

To excavate the hole which may be as small as 1 ft (0.3 metres) in diameter to access the main, the air-knife 20 is attached to the handle 10 via coupling 22. Any earth is removed and any water vacuumed out so that access to the main is then available.

To effect a repair to the pipe, a small hole is drilled into the pipe to gain access to the pipe interior using air drill 25 head and drill 26 attached via coupling 27 to the elongate handle 10.

To repair the main in the region of the aperture produced by drill 26, the Figure 2 arrangement is utilised which includes sealant injection head 30 with injector nozzle 31. The head is connected to the elongate housing 10 via coupling 32. The head 30 includes an integral pump which is powered by the air supply under the control of trigger 16 (see Figure 1). A source (not shown) of sealant (e.g. anaerobic fluid) is connected to flow tube 33 via coupling 34 so as to be injected into the main to effect sealing on hardening.

In practice, rather than the pipe being empty when being


Repair kit must be carried by the well carrying natural gas or other fluid, i.e. under 'live' conditions. In these circumstances it is necessary to include additional items in the repair kit and to carry out additional method steps to prevent gas escape during the drilling and sealing operations.

To inject fluid under these circumstances it is necessary to carry out the drilling operation in a number of steps as shown in relation to Figures 3 to 6.

The drilling operation described above is carried out only partially in the initial step by employing the depth gauge arrangement of Figure 3. Here the drill 26 is passed through the body of gauge 40 and set via screw 41 to extend beyond the end of the gauge by a set amount, dependent on the thickness of the pipe, to ensure that drilling will only cause an aperture to be formed in part of the pipe wall thickness (e.g. 10mm). This prevents any gas escape to the outside as part of the pipe wall is still between the aperture and the gas.

After this step has been carried out a tapping operation is effected using the Figure 4 arrangement.

An adaptor in the form of a quick release coupling



includes body portion 50 and square end adaptor 51 for slotting into the handle end in place of the drill head.

A tapping head includes body 53 for locating in adaptor end 52 which includes cutting tap 54 for producing an internal thread within the partial aperture drilled in the pipe.


During the tapping operation, with the air trigger 16 of Figure 1 removed, the air inlet 14 extending from the handle 10 at 90° can be manually grasped to assist in applying a turning torque to the tap when threading the pipe.

When tapping has been achieved, the tap is withdrawn and removed from the handle 10.

The next step requires the fitting of a nipple to the tapped aperture and is achieved using the Figure 5 arrangement. The coupling 50 of Figure 4 can be used again to which, in this case, the carrier 60 is coupled.

The carrier includes a bore 61 through the body and holds the nipple 63 by means of screw 62. The handle 10 is again rotated to effect screwing in of the nipple.

The threaded portion 65 of the nipple cannot extend into the pipe beyond the tapped portion.



Thereafter with the nipple 63 and carrier 60 still in place, the coupling 50 is removed and the drill head 25 is again fitted to elongate handle 10, as is the air trigger 16. A fine drill 68 is attached and the drill is operated through the bore 61 and the head of nipple 63 to penetrate the last remaining portion of the wall of pipe 70 to communicate with the gas in the bore of the pipe. Withdrawal of the drill 68 will not cause flow of gas externally, as the nipple forms a barrier to any gas flow.

The sealant can then be pumped into the pipe via the nipple using the arrangement described in Figure 2 above. The handle 10 can then be removed and the injector head left in place for (say) twenty minutes until the sealant has cured. The head can then be removed. The nipple can remain in place, with a suitable cover or cap if desired.

The arrangement using the above described kit provides a quick and safe method of sealing. The insulated handle 10 assists in this aim, being capable of withstanding internal pressure of more than 150 psi and electrical voltage of more than 100 KV.

CLAIMS:

1. A pipe repair device including
  - (a) an elongate insulated handle to allow operations to be carried out above ground,
  - (b) means for forming an aperture in the pipe attachable to the handle,
  - (c) means for fixing a fluid entry device to the pipe attachable to the handle, and
  - (d) means for injecting sealing fluid into the pipe via the entry device, said means for injecting sealing fluid being attachable to the handle.
2. A device as claimed in claim 1 including means attachable to the elongate handle for excavating the ground to gain access to the pipe to be repaired.
3. A device as claimed in claim 1 or 2 including means for completing the forming of the aperture in the pipe following fixation of the fluid entry device to the pipe.
4. A device as claimed in claim 3 including means for completing the aperture formation through an aperture present in the fluid entry device.

including means attachable to the elongate handle for forming a thread within the aperture in the pipe to allow the fluid entry device to be affixed to the pipe.

6. A method of repairing a fluid pipe including the steps of

forming an aperture in the pipe from above ground by means of a device attached to an elongate insulated handle;

fixing a fluid entry device to the pipe by means attached to the handle; and

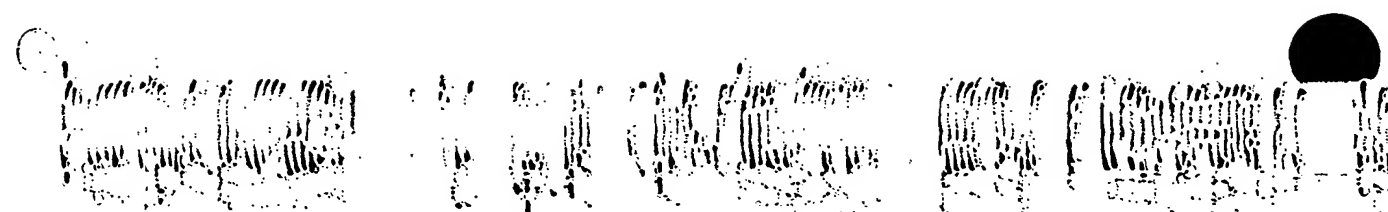
injecting sealing fluid into the pipe via the entry device by means attached to the handle.

7. A method as claimed in claim 6 including the step of completing the forming of the aperture in the pipe following the fixation of the fluid centring device step.

8. A method as claimed in claim 7 including the step of completing the aperture formation through an aperture present in the fluid entry device.

9. A method as claimed in any one of claims 6, 7 or 8 including the step of forming a thread within the aperture in the pipe to allow the fluid entry device to be affixed to the pipe.





10. A pipe repair device substantially as described herein with reference to the accompanying drawings.

11. A method of repairing a fluid pipe as claimed in claim 6 and substantially as described herein.



### PIPE REPAIR DEVICE AND METHOD

A device for repairing a pipe includes a number of kit items including an elongate insulated hollow handle 10 with compressed air inlet 14 and associated nipple 11. A trigger device 16 controlled by handle 17 receives compressed air to power attachments connected to adaptor 12. These include a drill head 25 which is powered by compressed air to drill into the pipe prior to using the device together with an injector head to inject sealant into the pipe from an above ground position.

[Fig. 1]

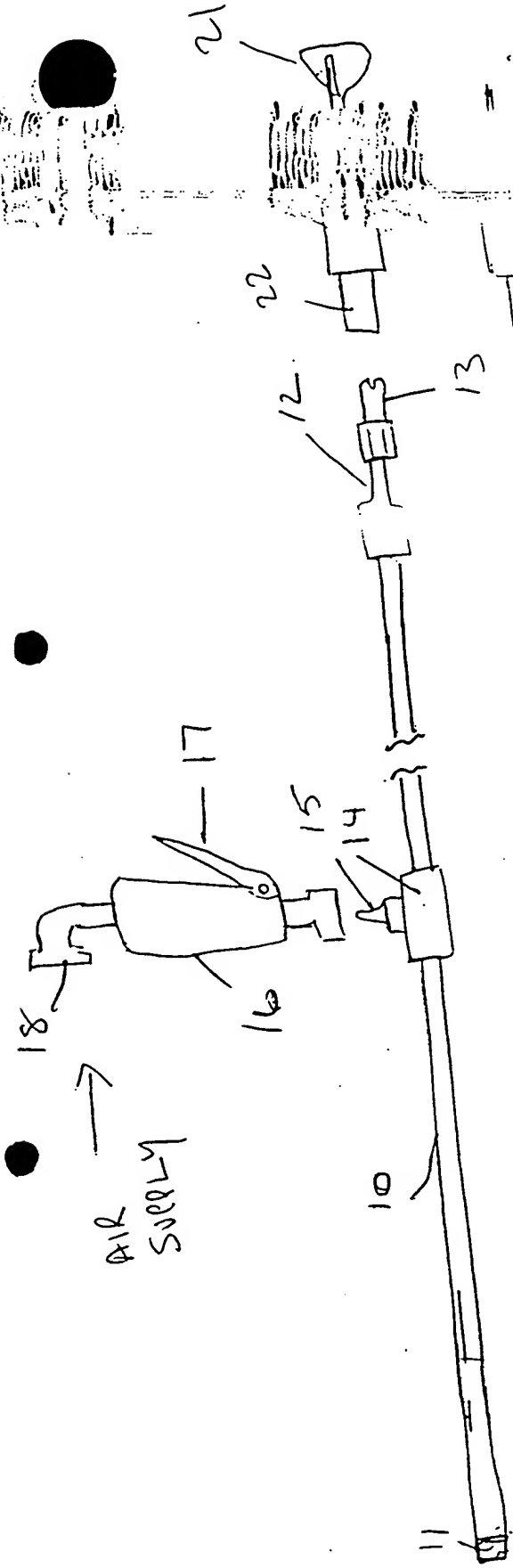


Fig 1

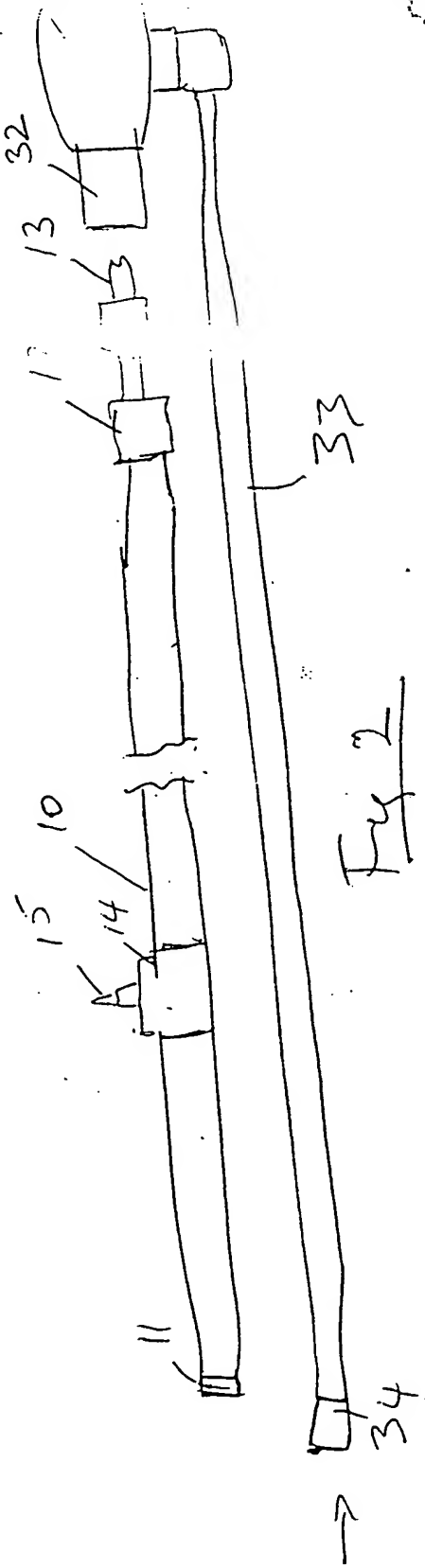


Fig 2

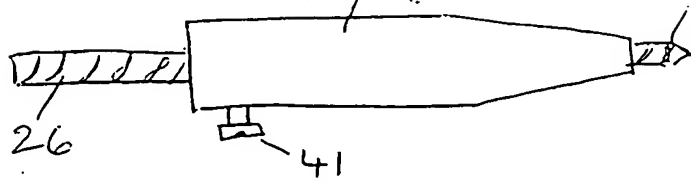


Fig 3

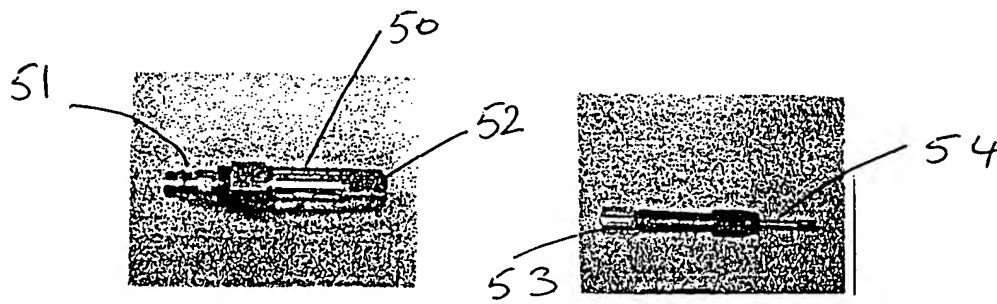


Fig 4

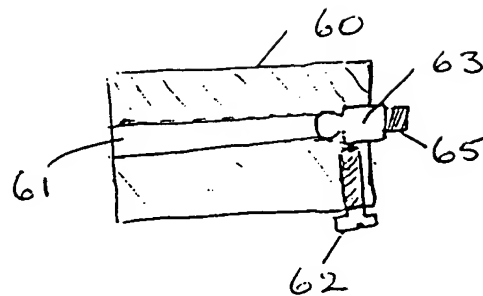


Fig 5

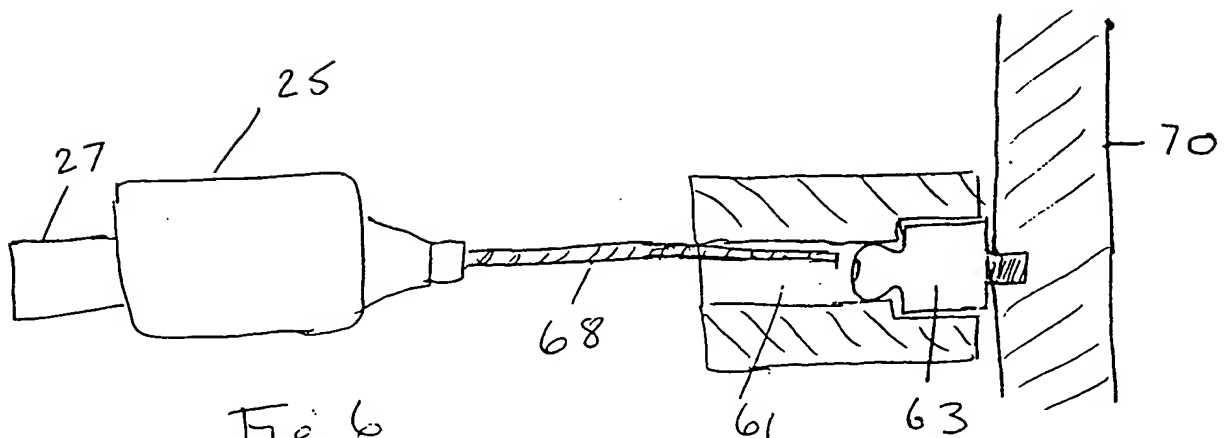


Fig 6